

# **Lung function and cardiovascular risk in young adults**

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## Declaration of originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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**Statement of ethical conduct**

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government’s Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

The CDAH study was approved by the Southern Tasmanian Health and Medical Research Ethics Committee. Ref H8152

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## **Abstract**

### ***Background***

Associations between poor lung function (LF) and cardiovascular disease (CVD) have been reported in patients with chronic obstructive pulmonary disease and in population samples of older adults, including lifelong non-smokers. There are few studies of this association in young adults.

Common modifiable risk factors for poor LF and CVD that might explain the association include smoking, low levels of physical activity, low cardiorespiratory fitness (CRF) and obesity. Systemic inflammation indicated by markers such as C-reactive protein (CRP), might also be explanatory.

### ***Aim***

The aims of this study were: 1) to investigate the cross-sectional and longitudinal associations of modifiable CVD risk factors with adult LF and 2) to investigate cross-sectional associations of young adult LF with CRP and carotid artery structure and function as subclinical indicators of atherosclerosis.

### ***Methods***

Data for this study were obtained from sub-samples of 2,410 participants of the 1985 Australian Schools Health and Fitness Survey who had follow up health assessments between 2004-2006 when aged 26-36 years of age.

Data from at least 1,700 participants were used to investigate cross-sectional associations of smoking, CRF, adiposity and CRP with adult LF (forced expiratory volume in one second (FEV<sub>1</sub>) and forced vital capacity (FVC). Longitudinal data were also examined to determine the effects on adult LF of: childhood and parental smoking (in 278 daily and 1,515 never smokers respectively), poor childhood CRF and obesity (among approximately 600 participants with baseline data). Associations between adult lung function and ultrasound measures of carotid intima-media thickness (cIMT) and arterial elasticity were also assessed.

### ***Results***

Adult smokers had higher mean lung volumes than non-smokers. Among daily smokers, cumulative cigarette exposure and childhood smoking had significant independent negative effects on adult LF. Higher CRF was positively associated with LF and was independent of adiposity among females. Adiposity was negatively associated with LF. Adult fitness and adiposity were much more strongly associated with adult LF than were childhood measures.

Weak negative associations between CRP and adult LF were observed which were stronger in participants with greater than average adiposity. Lower FEV<sub>1</sub> and FVC in female never-smokers and lower FEV<sub>1</sub>/FVC in ever-smoking males were associated with thicker cIMT, but the latter associations were confounded by cumulative smoke exposure. No independent associations between lung function and arterial elasticity were observed for males or females.

### ***Conclusion***

Overall, adiposity was more strongly associated with LF than either smoking, CRF or CRP. In these young adults, there was little evidence of an independent association between LF and subclinical atherosclerosis in males. However, a significant association between LF and cIMT was evident for female never smokers independent of other known CVD risk factors.



## Statement of contribution

The data used in this study come from the Childhood Determinants of Adult Health (CDAH), a large national cohort of Australian adults who had originally participated in a study of Australian children in 1985 when they were aged between 7 and 15 years of age.

I have been involved in the CDAH study since May 2001. I was responsible for the day-to-day running of a pilot study, funded by the Australian Heart Foundation. The pilot study tested the feasibility of tracing and recruiting participants of the 1985 Australian Health and Fitness Survey for follow up measures. The results of the pilot study were used in the National Health and Medical Research Association grant application that provided funding for following up the full cohort, the CDAH study.

I assisted in the planning and management of the main CDAH study including: protocol and questionnaire development, grant and ethics applications, database development and data management including preparing data for matching with the National Death Index and the Australian Electoral Commission.

I also assisted in the preparation of study materials: including questionnaires, participant information leaflets and newsletters. I trained, managed and assisted volunteers and staff who traced and recruited study participants.

I was involved in data collection at the first Tasmanian clinics and helped train the study technicians at the first mainland clinic in Victoria. I also assisted with cleaning of all collected data and helped in the analysis and development of strategies to maximise participant response rates.

For this thesis, I was responsible for cleaning the lung function and physical fitness data and designed the research questions proposed.

## Statement regarding published work contained in thesis

This thesis includes (or will include) three papers for which I am not the sole author. However, I have been the lead author in these papers, designed the research questions, cleaned and analysed the data, drafted the manuscript then revised it in response to the comments of my co-authors (four of whom were my PhD supervisors<sup>†</sup> or expert advisors<sup>‡</sup>). The contributions of each author are detailed below:

### ***The paper reported in Chapter 5***

**Curry BA**, Blizzard CL, Schmidt MD, Walters EH, Dwyer T, Venn AJ. Longitudinal associations of adiposity with adult lung function in the Childhood Determinants of Adult Health (CDAH) Study. *Obesity* 2011; 19(10):2069-75

BC cleaned the data and undertook all the analysis. Contributed to the interpretation of the results, drafted and then revised the manuscript in response to feedback from her co-authors.

LB<sup>†</sup> provided statistical expertise and provided comments on the manuscript.

MS<sup>†</sup> provided statistical support and provided comments on the manuscript.

EHW<sup>‡</sup> provided respiratory and clinical expertise and provided comments on the manuscript.

TD was responsible for the conception of the CDAH and provided comments on the manuscript.

AV<sup>†</sup> was involved in the conception of the CDAH study and the acquisition of data. She also provided assistance with data interpretation and revisions of the manuscript.

### ***Chapter 6 was written as a paper for submission to a peer-reviewed journal***

**Curry BA**, Blizzard L, Walters EH, Dwyer T, Venn A

The contribution of adiposity to the association between C-reactive protein and lung function in young adults.

BC cleaned the data and undertook all the analysis. Contributed to the interpretation of the results, drafted then revised the manuscript in response to feedback from her co-authors.

LB<sup>†</sup> provided statistical expertise and provided comments on the manuscript.

EHW<sup>‡</sup> provided respiratory and clinical expertise and provided comments on the manuscript.

TD was responsible for the conception of the CDAH study and provided comments on the manuscript.

AV<sup>†</sup> was involved in the conception of the CDAH study and the acquisition of data. She also provided assistance with data interpretation and revisions of the manuscript.

**Chapter 7 was written as a paper for submission to a peer-reviewed journal**

Curry BA, Blizzard L, Magnussen C, Walters EH, Dwyer T, Venn A

Lung function and vascular structure and function in young adults.

BC cleaned the data and undertook all the analysis. Contributed to the interpretation of the results, drafted then revised the manuscript in response to feedback from her co-authors.

LB<sup>†</sup> provided statistical expertise.

CM was responsible for data collection, provided assistance with data interpretation and provided comments on the manuscript.

EHW<sup>†</sup> provided respiratory and clinical expertise and provided comments on the manuscript.

TD was responsible for the conception of CDAH study and provided comments on the manuscript.

AV<sup>†</sup> was involved in the conception of the CDAH study and the acquisition of data. She also provided assistance with data interpretation and revisions of the manuscript.

Signed:	Date:
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Alison Venn, Primary supervisor



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